CHI MEI
OPTOELECTRONICS CORP.

Approval

TFT LCD Approval Specification

MODEL NO.: V400H1   - LH5

Approved By	TVHD
	LY Chen

Reviewed By	QA Dept.	Product Development Div.
	Tomy Chen	WT Lin

Prepared By	LCD TV Marketing and Product Management Div.	
	WY Li	Alan Chang

1

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

- CONTENTS -

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver 2.0	Dec. 11,'08	All	All	Approval Specification was first issued.

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V400H1- LH5 is a 40" TFT Liquid Crystal Display module with 14-CCFL Backlight unit and 2ch-LVDS interface. This module supports 1920 x 1080 FHD format and can display true 1G colors (10-bits/color). The inverter module for backlight is built-in.

1.2 FEATURES

- High brightness (500 nits)
- Ultra-high contrast ratio (4000:1)
- Faster response time (Gray to gray average 4.0ms)
- High color saturation NTSC 72%
- Ultra wide viewing angle : 176(H)/176(V) (CR>20) with Super MVA technology
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Color reproduction (nature color)
- Optimized response time for both 120 Hz Frame rate
- Low color shift function
- RoHS compliance

1.3 APPLICATION

- TFT LCD TVs
- Multi-Media Display

1.4 GENERAL SPECIFICATI0NS

Item	Specification	Unit	Note
Active Area	885.6(H) x 498.15 (V) (40" diagonal)	mm	(1)
Bezel Opening Area	891.7 (H) x 504.2 (V)	mm	
Driver Element	a-si TFT active matrix	-	
Pixel Number	1920 x R.G.B. x 1080	pixel	
Pixel Pitch (Sub Pixel)	0.15375 (H) x 0.46125 (V)	mm	
Pixel Arrangement	RGB vertical stripe	-	
Display Colors	1G	color	
Display Operation Mode	Transmissive mode / Normally black	-	
Surface Treatment	Anti-Glare coating (SC), Hard coating (3H)	-	

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal(H)	951	952	953	mm	(1)
	Vertical(V)	550	551	552	mm	(1)
	Depth(D)	39.5	40.5	41.5	mm	To Socket Cover
	Depth(D)	49	50	51	mm	To PCB Cover
Weight		-	9550	-	g	

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	T_{ST}	-20	+60	ºC	(1)
Operating Ambient Temperature	T_{OP}	0	+50	ºC	(1), (2)
Shock (Non-Operating)	S_{NOP}	-	50	G	(3), (5)
Vibration (Non-Operating)	V_{NOP}	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

     (a) 90 %RH Max. (Ta $\leqq$ 40 ºC).

     (b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

     (c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of

     display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber.

     Thermal management should be considered in final product design to prevent the surface temperature of

     display area from being over 65 ºC. The range of operating temperature may degrade in case of improper

     thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough

     so that the module would not be twisted or bent by the fixture.

Relative Humidity (%RH)

Temperature (ºC)

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval
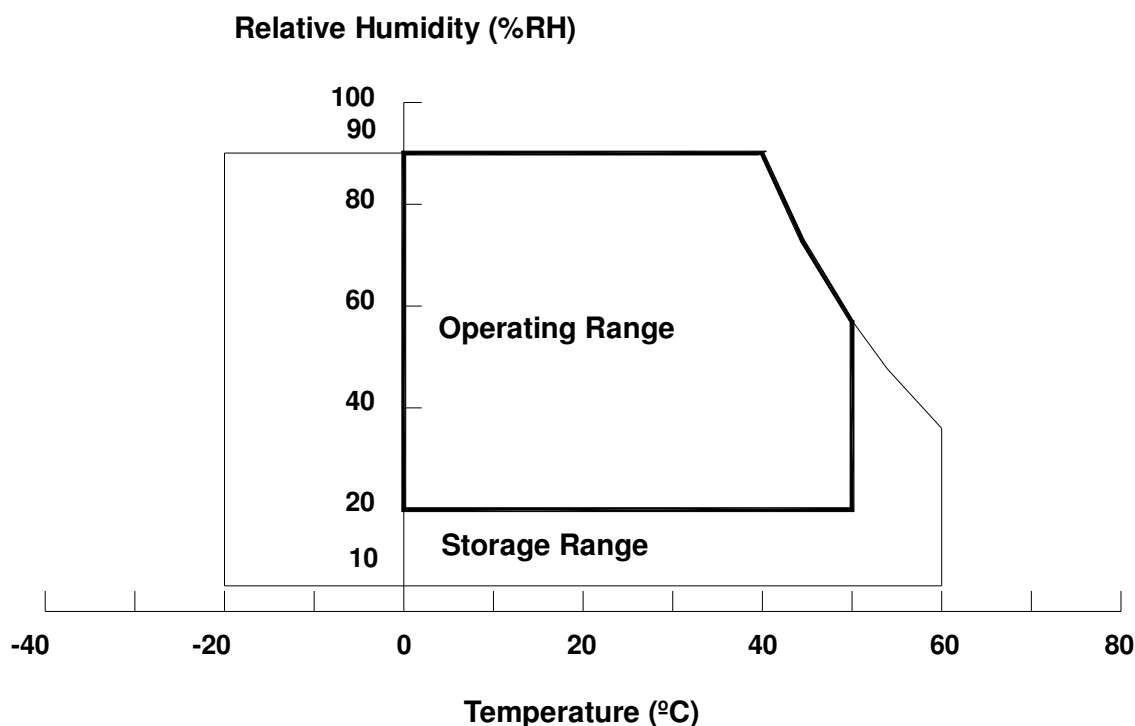
2.2 PACKAGE STORAGE

When storing modules as spares for a long time, the following precaution is necessary.

(a) Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35 ºC at normal humidity without condensation.

(b) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

2.3 ELECTRICAL ABSOLUTE RATINGS

2.3.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	Vcc	-0.3	13.5	V	(1)
Input Signal Voltage	V_{IN}	-0.3	3.6	V	

2.3.2 BACKLIGHT UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Lamp Voltage	V_W	—	3000	V_{RMS}	

Note (1) No moisture condensation or freezing.

6

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD MODULE

Ta = 25 ± 2 ºC

Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	10.8	12.0	13.2	V	(1)
Power Supply Ripple Voltage		V_{RP}	-	-	350	mV	
Rush Current		I_{RUSH}	-	-	4.5	A	(2)
Power Supply Current	White	I_{CC}	-	2.6	2.8	A	(3)
	Black		-	2	2.1	A	
	Vertical Stripe		-	2.6	2.9	A	
LVDS Interface	Common Input Voltage	V_{LVC}	1.125	1.25	1.375	V	
	Terminating Resistor	R_T	-	100	-	ohm	
CMOS interface	Input High Threshold Voltage	V_{IH}	2.7	-	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	-	0.7	V	

Note (1) The module should be always operated within above ranges.

Note (2) Measurement Conditions:

Vcc rising time is 470us

7

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1　- LH5

Approval
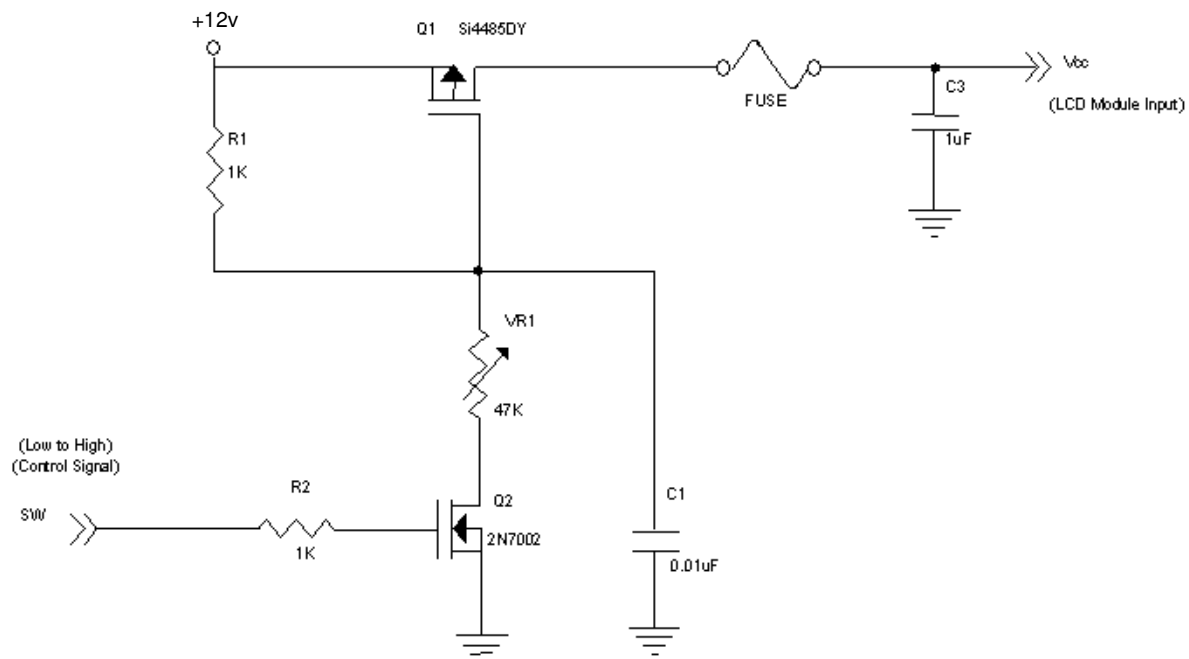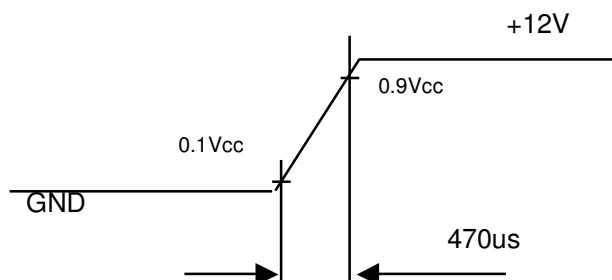
Note (3) The specified power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, f_v = 60

Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern
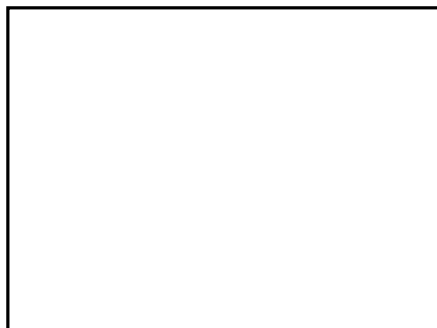
Active Area

b. Black Pattern

Active Area

c. Vertical Stripe Pattern

Active Area
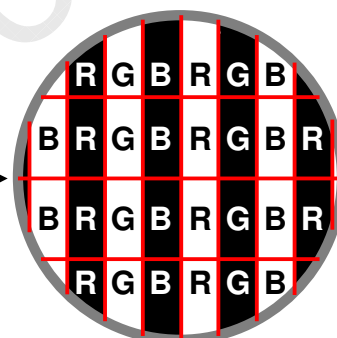
3.2 BACKLIGHT UNIT

3.2.1 CCFL (Cold Cathode Fluorescent Lamp) CHARACTERISTICS (Ta = 25 ± 2 ºC)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Lamp Voltage	V_W	-	1020	-	V_{RMS}	Ih =11.0mA
Lamp Current	I_L	10.7	11.0	11.3	mA_{RMS}	(1)
Lamp Starting Voltage	V_S	-	-	1680	V_{RMS}	(2), Ta = 0 ºC
		-	-	1400	V_{RMS}	(2), Ta = 25 ºC
Operating Frequency	F_O	30	-	80	kHz	(3)
Lamp Life Time	L_{BL}	50,000	-	-	Hrs	(4), at 11.5mA

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.　　**Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

4. BLOCK DIAGRAM

4.1 TFT LCD MODULE

ERX0(+/-)
ERX1(+/-)
ERX2(+/-)
ERX3(+/-)
ERX4(+/-)
ECLK(+/-)
LVDS_SEL

ORX0(+/-)
ORX1(+/-)
ORX2(+/-)
ORX3(+/-)
ORX4(+/-)
OCLK(+/-)
Vcc
GND

INPUT CONNECTOR
(FI-RE51S-HF)

CN1

FRAME BUFFER

TIMING CONTROLLER

DC/DC CONVERTER & REFERENCE VOLTAGE

SCAN DRIVER IC

TFT LCD PANEL
(1920x3x1080)

DATA DRIVER IC

CON1 : S12B-PH-SM3-TB (JST)

LIPS

SOCKET

BACKLIGHT UNIT

CON2 : S14B-PH-SM3-TB (JST)

SOCKET : 90050GS-40GLQ(YEONHO)

9

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

5. INTERFACE PIN CONNECTION

5.1 TFT LCD MODULE

CN505 Connector Pin Assignment

Pin No.	Symbol	Description
1	VIN	+12.0V power supply
2	VIN	+12.0V power supply
3	VIN	+12.0V power supply
4	VIN	+12.0V power supply
5	VIN	+12.0V power supply
6	NC	No connection
7	GND	Ground
8	GND	Ground
9	GND	Ground
10	ODD_RIN0N	Negative transmission data of First pixel 0
11	ODD_RIN0P	Positive transmission data of First pixel 0
12	ODD_RIN1N	Negative transmission data of First pixel 1
13	ODD_RIN1P	Positive transmission data of First pixel 1
14	ODD_RIN2N	Negative transmission data of First pixel 2
15	ODD_RIN2P	Positive transmission data of First pixel 2
16	GND	Ground
17	ODD_RINCLKN	Negative of First clock
18	ODD_RINCLKP	Positive of First clock
19	GND	Ground
20	ODD_RIN3N	Negative transmission data of First pixel 3
21	ODD_RIN3P	Positive transmission data of First pixel 3
22	ODD_RIN4N	Negative transmission data of First pixel 4
23	ODD_RIN4P	Positive transmission data of First pixel 4
24	GND	Ground
25	EVEN_RIN0N	Negative transmission data of Second pixel 0
26	EVEN _RIN0P	Positive transmission data of Second pixel 0
27	EVEN _RIN1N	Negative transmission data of Second pixel 1
28	EVEN _RIN1P	Positive transmission data of Second pixel 1
29	EVEN _RIN2N	Negative transmission data of Second pixel 2
30	EVEN _RIN2P	Positive transmission data of Second pixel 2
31	GND	Ground
32	EVEN _RINCLKN	Negative of Second clock
33	EVEN _RINCLKP	Positive of Second clock
34	GND	Ground
35	EVEN _RIN3N	Negative transmission data of Second pixel 3
36	EVEN _RIN3P	Positive transmission data of Second pixel 3
37	EVEN _RIN4N	Negative transmission data of Second pixel 4
38	EVEN _RIN4P	Positive transmission data of Second pixel 4
39	GND	Ground
40	SCL_I	SEC define
41	SDA_I	SEC define

10

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

42	TCON_CHECK	SEC define
43	TST_PGM	SEC define
44	HSYNC	SEC define
45	LVDS_SEL	SEC define
46	I2C_SCL	SEC define
47	FRC_NRESET	SEC define
48	I2C_SDA	SEC define
49	SW_PVCC	SEC define
50	MAIN_CHECK	SEC define
51	NC	No connection

Note (1) CN505 Connector Part No.: JAE Taiwan (台灣航空電子) FI-RE51S-HF or equal.

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1　　- LH5

Approval

5.2 BACKLIGHT UNIT

The pin configuration for the housing and leader wire is shown in the table below.

Pin No.	Symbol	Description	Wire Color
NA	NA	NA	NA

Note (1) The backlight interface housing for high voltage side is a model 90050GS-40GLQ (SOCKET), manufactured by YEONHO.

LV	——————————————————	SOCKET
HV	——————————————————	SOCKET
LV	——————————————————	SOCKET
HV	——————————————————	SOCKET
LV	——————————————————	SOCKET
HV	——————————————————	SOCKET
LV	——————————————————	SOCKET
HV	——————————————————	SOCKET
LV	——————————————————	SOCKET
HV	——————————————————	SOCKET
LV	——————————————————	SOCKET
HV	——————————————————	SOCKET
LV	——————————————————	SOCKET
HV	——————————————————	SOCKET

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.　　**Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

5.3 BLOCK DIAGRAM OF INTERFACE

13

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**
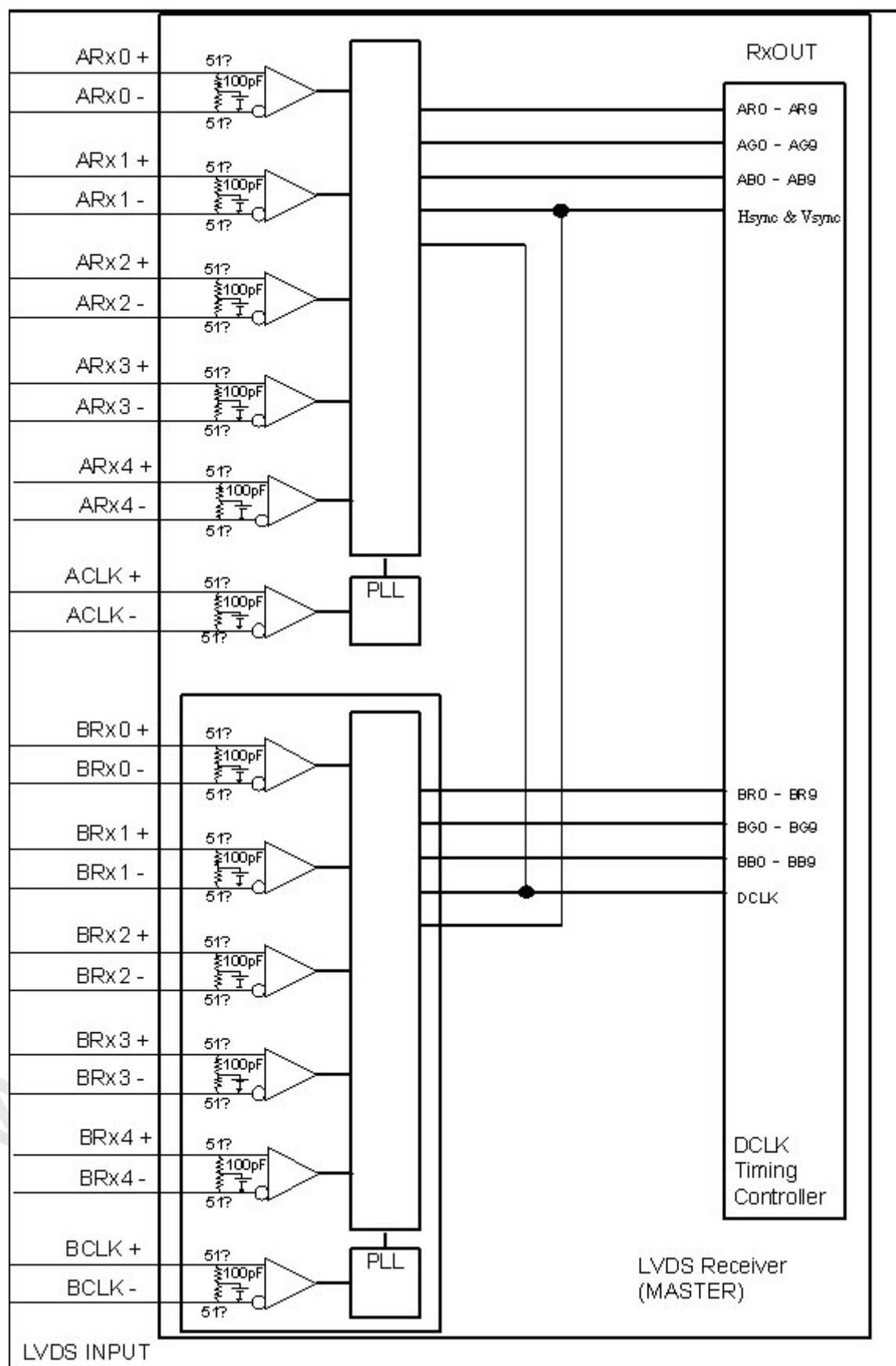
ER0~ER9 : Even pixel R data

EG0~EG9 : Even pixel G data

EB0~EB9 : Even pixel B data

OR0~OR9 : Odd pixel R data

OG0~OG9: Odd pixel G data

OB0~OB9 : Odd pixel B data

DE   : Data enable signal

DCLK   : Data clock signal

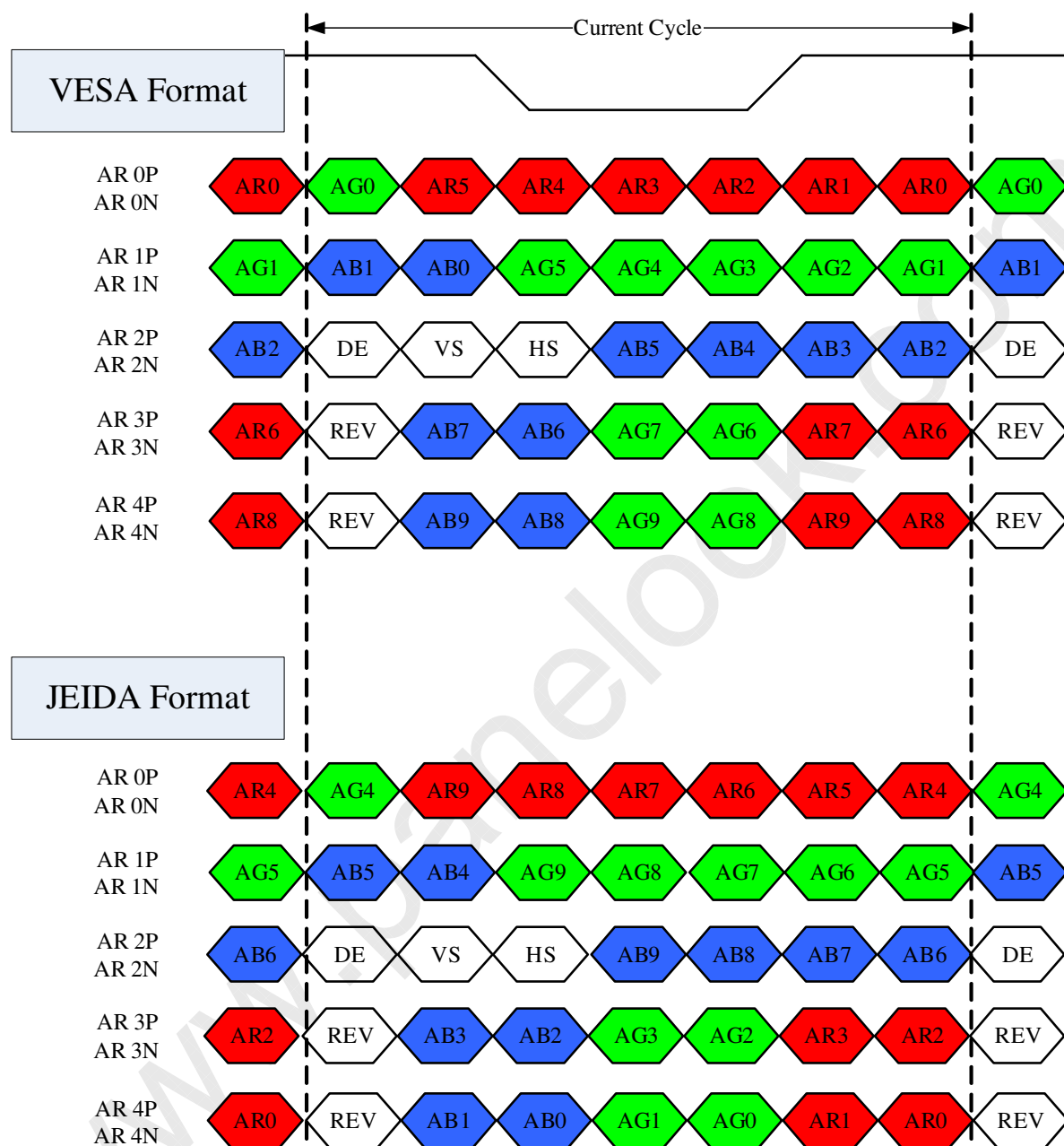Note (1) The system must have the transmitter to drive the module.

Note (2) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

Note (3) Two pixel data send into the module for every clock cycle. The first pixel of the frame is odd pixel and the second pixel is even pixel.

14

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

5.4 LVDS INTERFACE

VESA Format : SELLVDS = H or Open

JEIDA Format : SELLVDS = L

VESA Format

AR 0P / AR 0N	AR0	AG0	AR5	AR4	AR3	AR2	AR1	AR0	AG0
AR 1P / AR 1N	AG1	AB1	AB0	AG5	AG4	AG3	AG2	AG1	AB1
AR 2P / AR 2N	AB2	DE	VS	HS	AB5	AB4	AB3	AB2	DE
AR 3P / AR 3N	AR6	REV	AB7	AB6	AG7	AG6	AR7	AR6	REV
AR 4P / AR 4N	AR8	REV	AB9	AB8	AG9	AG8	AR9	AR8	REV

JEIDA Format

AR 0P / AR 0N	AR4	AG4	AR9	AR8	AR7	AR6	AR5	AR4	AG4
AR 1P / AR 1N	AG5	AB5	AB4	AG9	AG8	AG7	AG6	AG5	AB5
AR 2P / AR 2N	AB6	DE	VS	HS	AB9	AB8	AB7	AB6	DE
AR 3P / AR 3N	AR2	REV	AB3	AB2	AG3	AG2	AR3	AR2	REV
AR 4P / AR 4N	AR0	REV	AB1	AB0	AG1	AG0	AR1	AR0	REV

AR0~AR9: First Pixel R Data (9; MSB, 0; LSB)

AG0~AG9: First Pixel G Data (9; MSB, 0; LSB)

AB0~AB9: First Pixel B Data (9; MSB, 0; LSB)

DE   : Data enable signal

DCLK : Data clock signal

RSVD : Reserved

15

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1　　- LH5

Approval

5.5 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 10-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																													
		Red										Green										Blue									
		R9	R8	R7	R6	R5	R4	R3	R2	R1	R0	G9	G8	G7	G6	G5	G4	G3	G2	G1	G0	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red (1021)	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1022)	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1023)	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green (1021)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0
	Green (1022)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0
	Green (1023)	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (1021)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	1
	Blue (1022)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0
	Blue (1023)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.　　**Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1　　- LH5

Approval

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

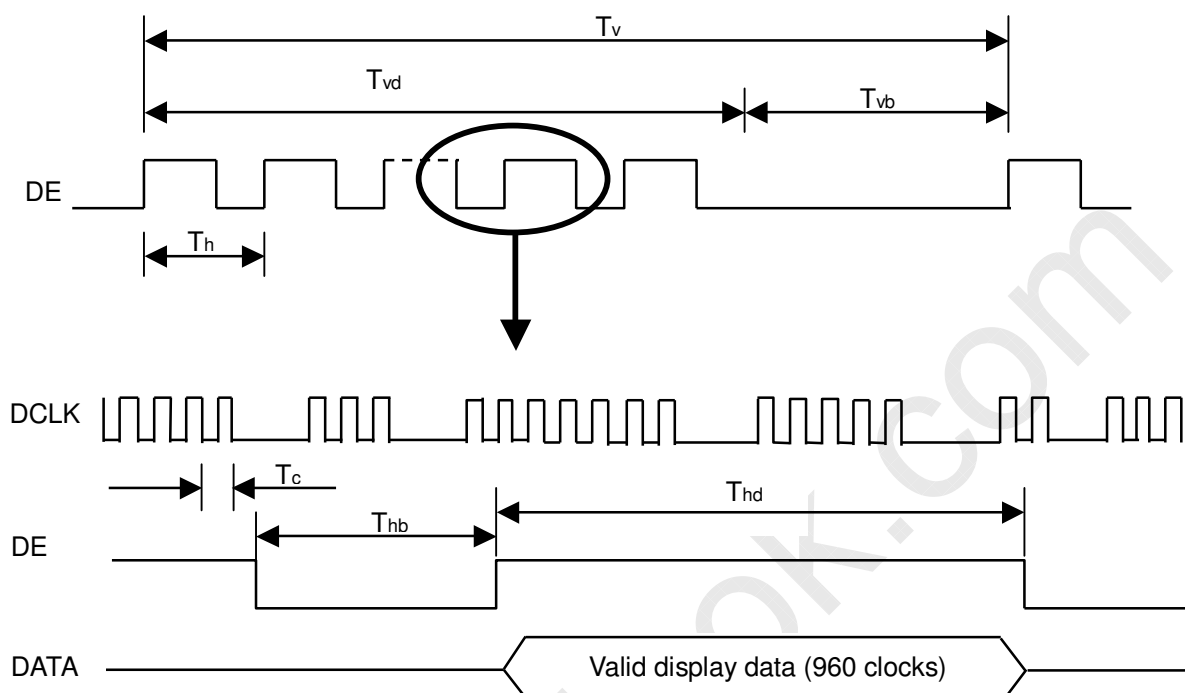The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	1/Tc	-	74	-	MHz	
Hsync		Fh	-	67.5	-	KHz	
Vsync		Fv	-	59.94	-	Hz	
LVDS Receiver Data	Setup Time	Tlvsu	600	-	-	ps	
	Hold Time	Tlvhd	600	-	-	ps	
Vertical Active Display Term	Frame Rate	Fr$_6$	57	60	63	Hz	
	Total	Tv	-	1125	-	Th	Tv=Tvd+Tvb
	Display	Tvd	-	1080	-	Th	-
	Blank	Tvb	-	45	-	Th	-
Horizontal Active Display Term	Total	Th	-	2200	-	Tc	Th=Thd+Thb
	Display	Thd	-	1920	-	Tc	-
	Blank	Thb	-	280	-	Tc	-

6.2 INTERNAL SIGNAL TIMING SPECIFICATIONS (FRC→ T-CON)

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	1/Tc	60	74	80	MHz	(1)
Hsync		Fh	-	135	-	KHz	
Vsync		Fv	-	120	-	Hz	
LVDS Receiver Data	Setup Time	Tlvsu	600	-	-	ps	
	Hold Time	Tlvhd	600	-	-	ps	
Vertical Active Display Term	Frame Rate	Fr$_6$	-	120	-	Hz	
	Total	Tv	1115	1125	1410	Th	Tv=Tvd+Tvb
	Display	Tvd	1080	1080	1080	Th	-
	Blank	Tvb	35	45	330	Th	-
Horizontal Active Display Term	Total	Th	540	550	663	Tc	Th=Thd+Thb
	Display	Thd	480	480	480	Tc	-
	Blank	Thb	60	70	183	Tc	-

Note (1) Since the module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.
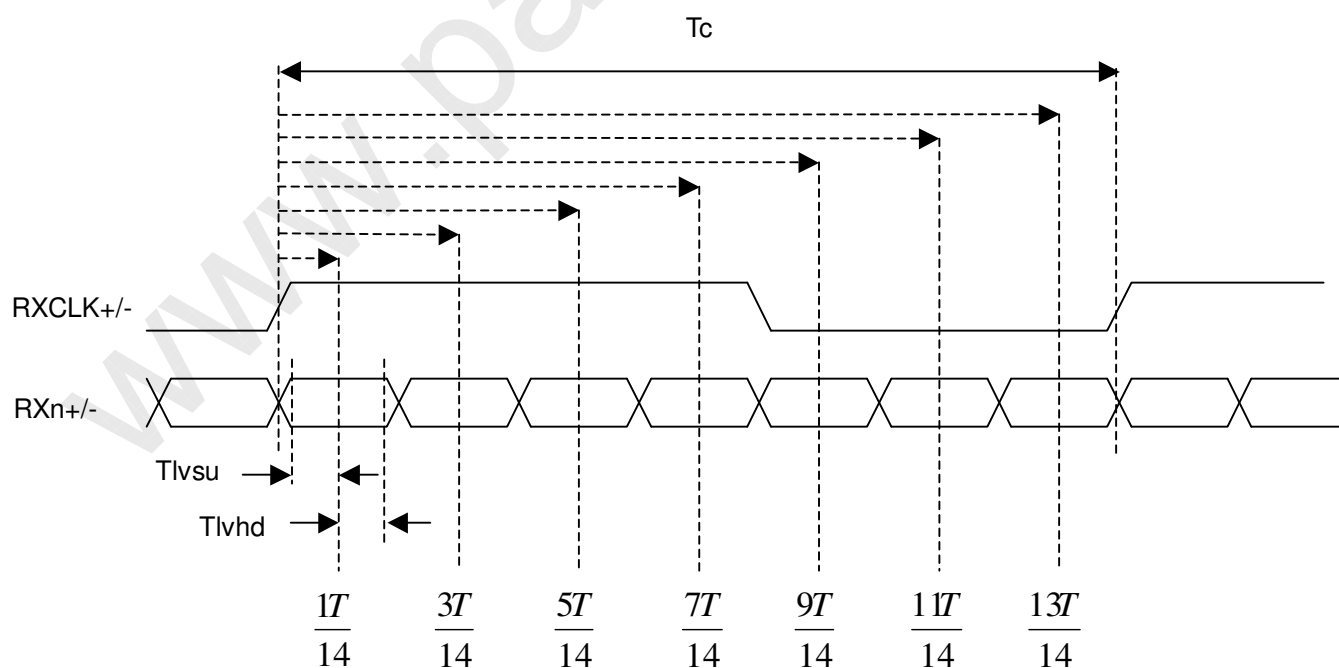
Note (2) LVDS Clock should not over 80MHz even if H-total or V-total is in spec, and the frequency follows the equation below.

LVDS CLK= Frame rate * H-total * V-total

17

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.　　**Version 2.0**

CHI MEI
OPTOELECTRONICS CORP.

Approval

INPUT SIGNAL TIMING DIAGRAM

DE

T_v

T_{vd}

T_{vb}

T_h

DCLK

T_c

DE

T_{hb}

T_{hd}

DATA   Valid display data (960 clocks)

LVDS RECEIVER INTERFACE TIMING DIAGRAM

Tc

RXCLK+/-

RXn+/-

Tlvsu

Tlvhd

$\dfrac{1T}{14}$ $\dfrac{3T}{14}$ $\dfrac{5T}{14}$ $\dfrac{7T}{14}$ $\dfrac{9T}{14}$ $\dfrac{11T}{14}$ $\dfrac{13T}{14}$

18

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1　　- LH5

Approval

6.3 POWER ON/OFF SEQUENCE

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.

$0 \leqq T_1 \leqq 10ms$
$0 \leqq T_2 \leqq 50ms$
$0 \leqq T_3 \leqq 50ms$
$1000ms \leqq T_4$

$0 \leqq T_7 \leqq T_2$
$0 \leqq T_8$

Option Signals (SELLVDS)

Backlight (Recommended)
$1000ms \leqq T_5$
$100ms \leqq T_6$

Power ON/OFF Sequence
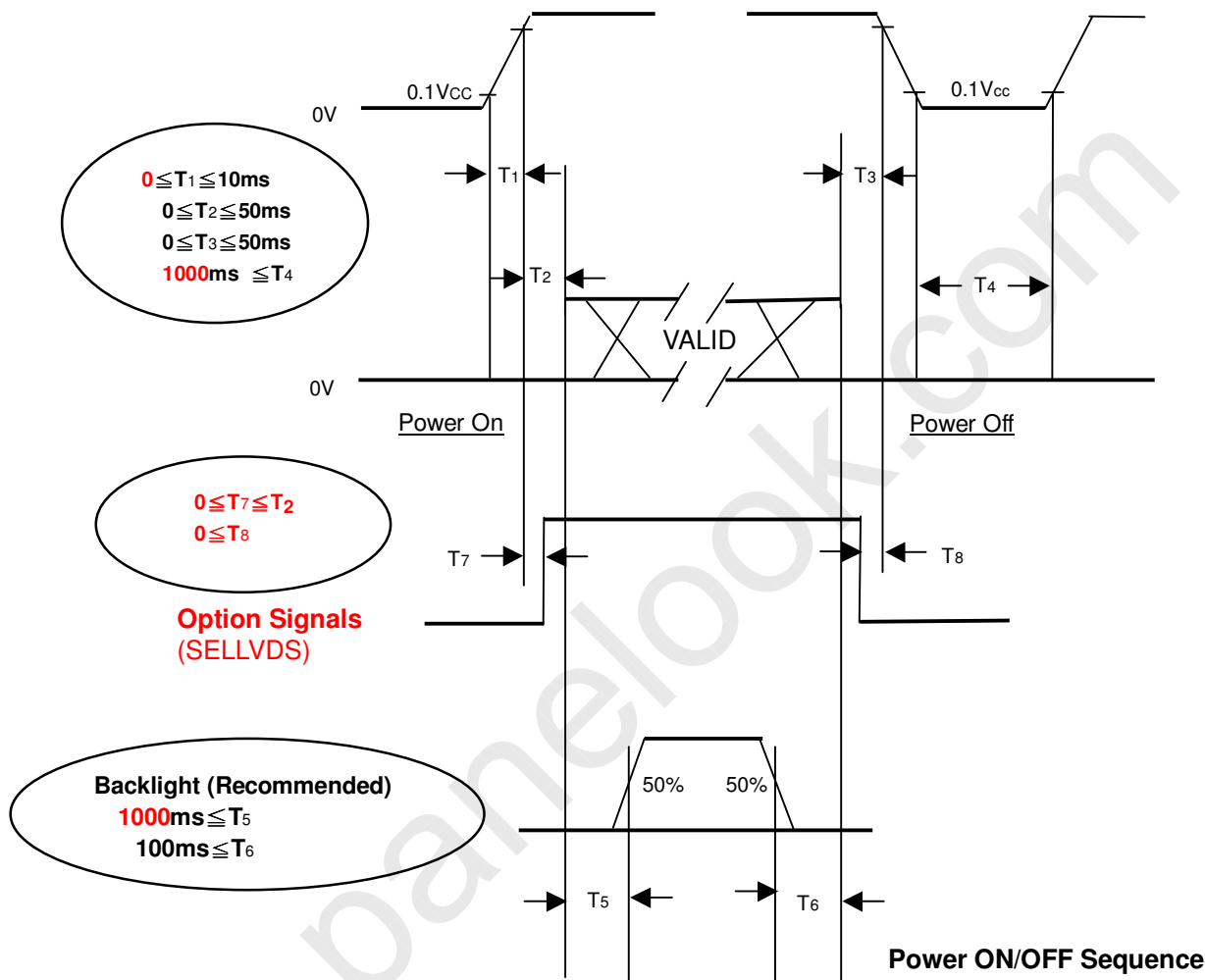
Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the lamp voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

Note (5) Interface signal shall not be kept at high impedance when the power is on.

Approval

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	^{o}C
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	12	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
Lamp Current(HV)	I_L	8.0 ± 0.3	mA
Oscillating Frequency (Balance Board)	F_W	48±3	KHz
Frame rate		120	Hz

7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should

be measured under the test conditions described in 7.1 and stable environment shown in Note (6).

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR		3000	4000	-	-	(2)
Response Time		Gray to gray average		-	4	8	ms	(3)
Center Luminance of White		L_C		450	500	-	cd/	(4)
White Variation		δW		-	-	1.3	-	(7)
Cross Talk		CT		-	-	4.0	%	(5)
Color Chromaticity	Red	Rx	θ_x=0°, θ_Y =0° Viewing angle at Normal direction	Typ. – 0.03	0.635	Typ. + 0.03	-	(6)
		Ry			0.323		-	
	Green	Gx			0.285		-	
		Gy			0.602		-	
	Blue	Bx			0.148		-	
		By			0.056		-	
	White	Wx			0.280		-	
		Wy			0.290		-	
	Color Gamut	CG		70	72		%	NTSC
Viewing Angle	Horizontal	θ_x+	CR≥20	80	88	-	Deg.	(1)
		θ_x-		80	88	-		
	Vertical	θ_Y+		80	88	-		
		θ_Y-		80	88	-		

Approval

Note (1)   Definition of Viewing Angle (θx, θy):

Viewing angles are measured by EZ-Contrast 160R (Eldim)

Normal

θx = θy = 0º

θy- θy+

θx- = 90º   x-

12 o'clock direction

θy+ = 90º

θx−

θx+

y+

6 o'clock   y-

θy- = 90º

x+ θx+ = 90º
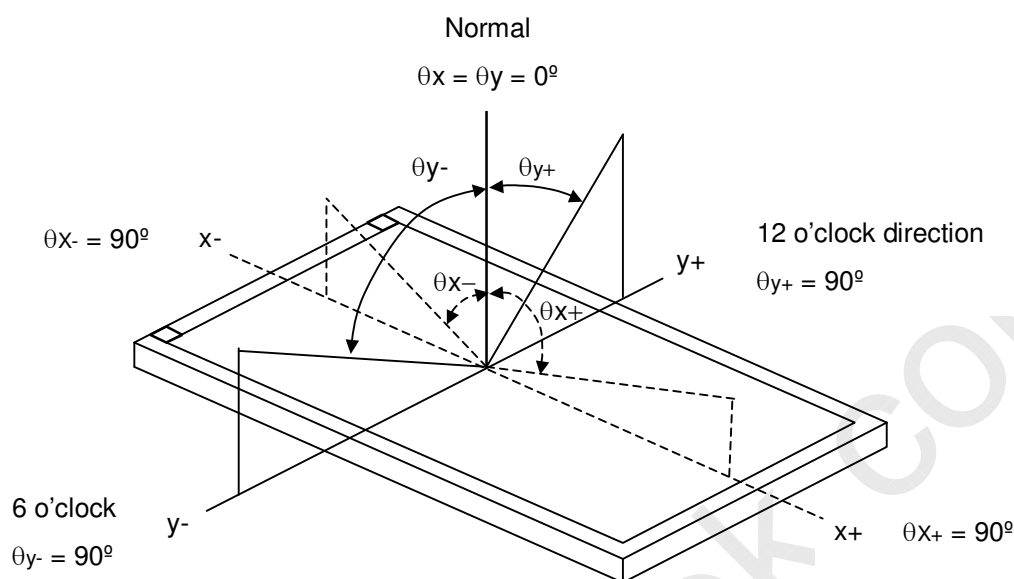
Note (2) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in

Note (7).

Note (3) Definition of Gray to Gray Switching Time :

100%
90%

Optical

Response

10%
0%

Time

Gray to gray
switching time

Gray to gray
switching time

21

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

CHI MEI
OPTOELECTRONICS CORP.

Approval
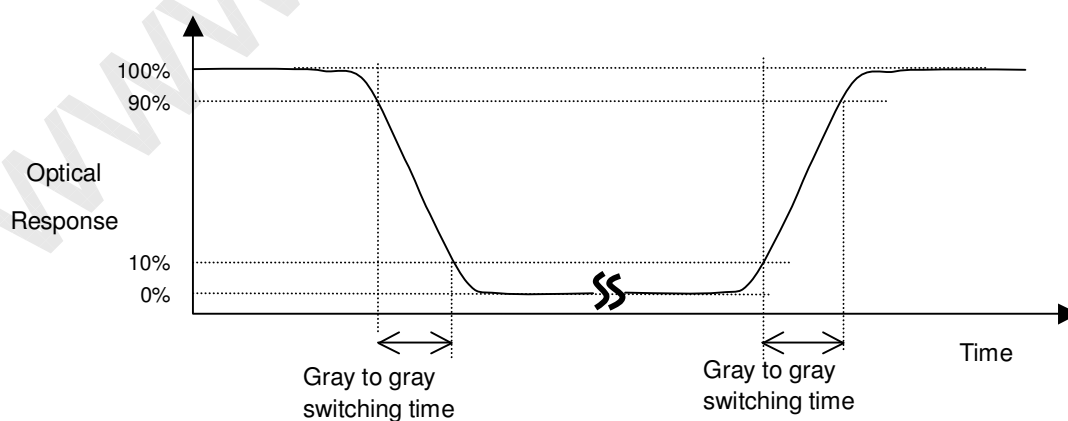
The driving signal means the signal of gray level 0, 63, 127, 191, 255.

Gray to gray average time means the average switching time of gray level 0 ,63,127,191,255 to each other .

Note (4) Definition of Luminance of White (L_C, L_{AVE}):

Measure the luminance of gray level 255 at center point and 5 points

$L_C = L\,(5)$

$L_{AVE} = [L\,(1)+ L\,(2)+ L\,(3)+ L\,(4)+ L\,(5)] / 5$

where $L\,(x)$ is corresponding to the luminance of the point X at the figure in Note (7).

Note (5) Definition of Cross Talk (CT):

$CT = |\,Y_B - Y_A\,| / Y_A \times 100\ (\%)$

Where:

(a)

Y_A = Luminance of measured location without gray level 255 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 255 pattern (cd/m^2)

(b)

Y_A = Luminance of measured location without gray level 255 pattern (cd/m^2)

Y_B = Luminance of measured location with gray level 255 pattern (cd/m^2)

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.　**Version 2.0**

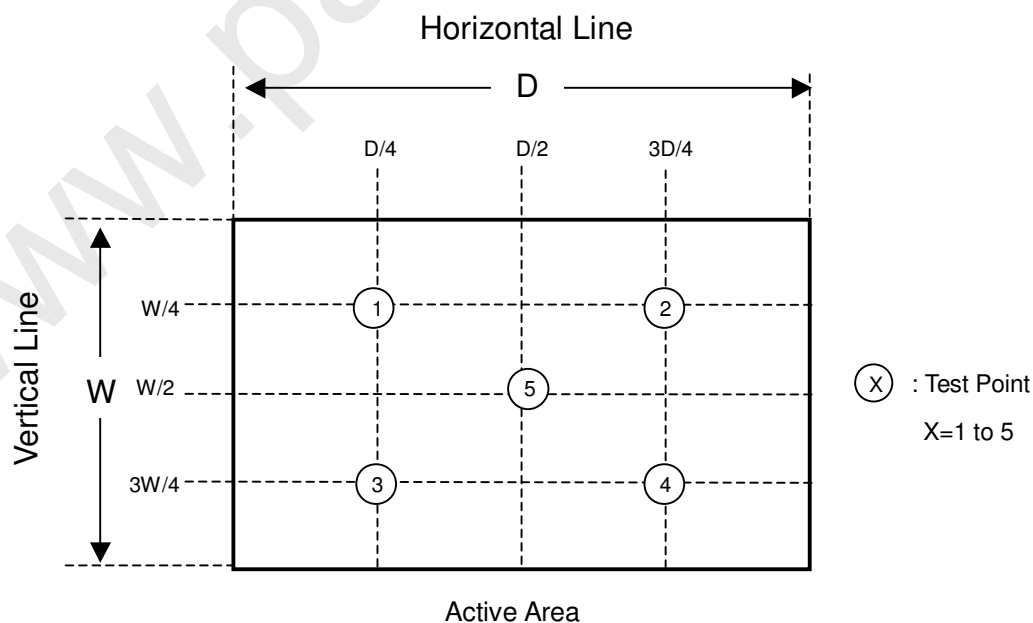Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval
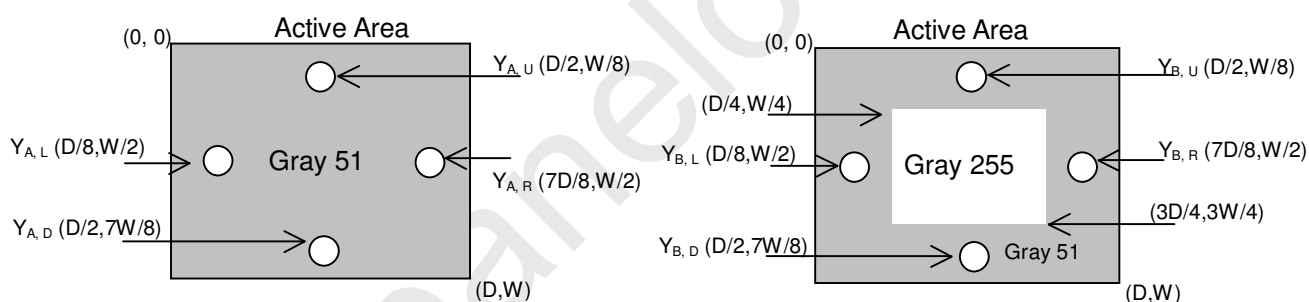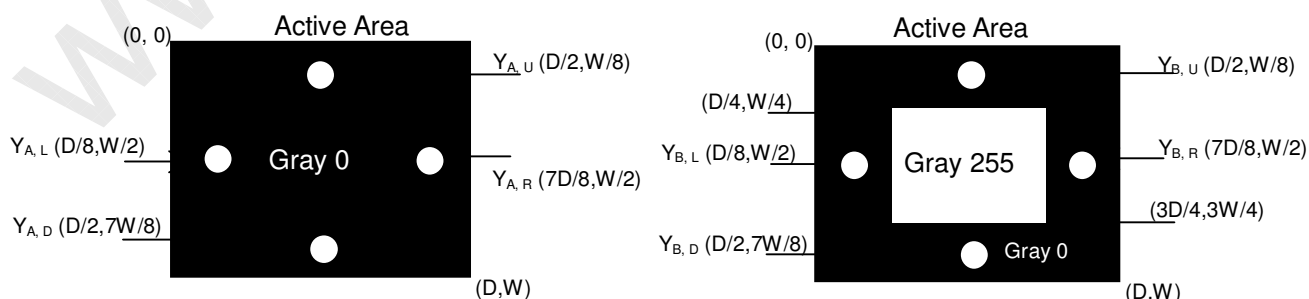
Note (6) Measurement Setup:

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 1 hour in a windless room.

LCD Module

LCD Panel

Center of the Screen

Display Color Analyzer
(Minolta CA210)

Light Shield Room

(Ambient Luminance < 2 lux)
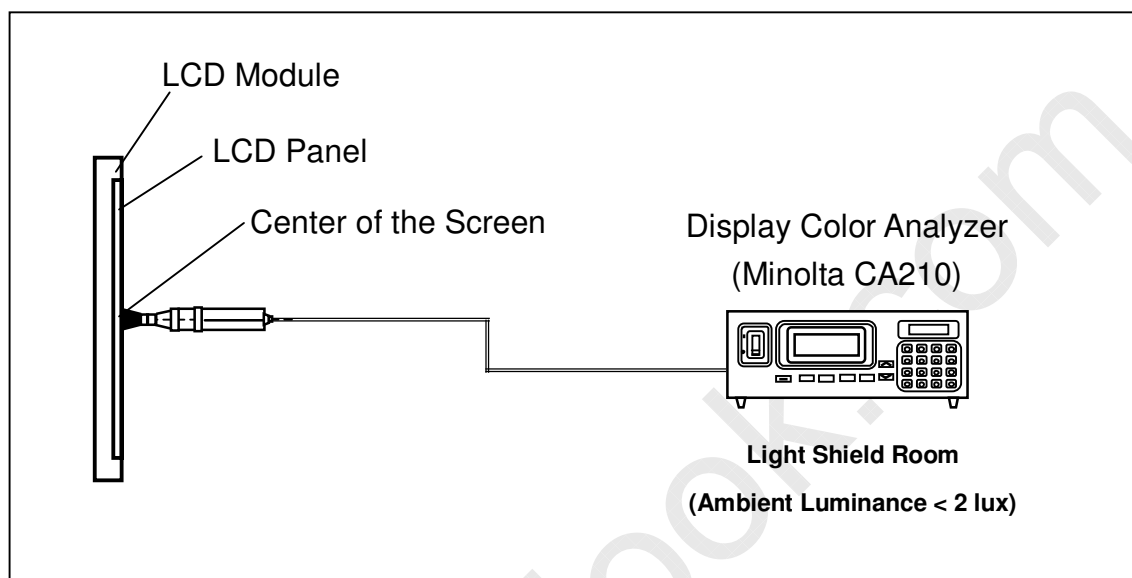
Note (7) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]

Horizontal Line

D

D/4   D/2   3D/4

Vertical Line

W

W/4   ①   ②

W/2   ⑤

3W/4   ③   ④

Ⓧ : Test Point
X=1 to 5

Active Area

23

Version 2.0

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

8. DEFINITION OF LABELS

8.1 CMO MODULE LABEL

The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.


```
                    V400H1         -LH5 Rev. XX

CHI   MEI           X X X X X X X Y M D L N N N N
OPTOELECTRONICS                                        MADE IN TAIWAN

                    CM40H15XXXXXLXXLYMDNNNN
```

E207943
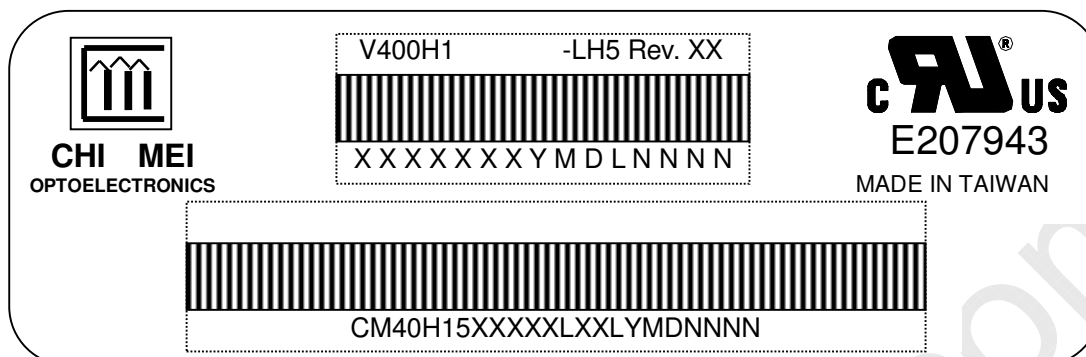
(a) Model Name: V400H1-LH5

(b) Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

(c) CMO barcode definition:

Serial ID: XX-XX-X-XX-YMD-L-NNNN

Code	Meaning	Description
XX	CMO internal use	-
XX	Revision	Cover all the change
X-XX	CMO internal use	-
YMD	Year, month, day	Year: 2001=1, 2002=2, 2003=3, 2004=4… Month: Jan. ~ Dec.=1, 2, 3, ~, 9, A, B, C Day: 1st to 31st =1, 2, 3, ~, 9, A, B, C, ~, W, X, Y, exclude I, O, and U
L	Product line #	Line 1=1, Line 2=2, Line 3=3, …
NNNN	Serial number	Manufacturing sequence of product

(d) Customer's barcode definition:

Serial ID: CM-40H15-X-X-X-XX-L-XX-L-YMD-NNNN

Code	Meaning	Description
CM	Supplier code	CMO=CM
40H15	Model number	V400H1-LH5=40H15
X	Revision code	C1=A, C2=B, ……C9=I
X	Source driver IC code	Century=1, CLL=2, Demos=3, Epson=4, Fujitsu=5, Himax=6, Hitachi=7, Hynix=8, LDI=9, Matsushita=A, NEC=B, Novatec=C,
X	Gate driver IC code	OKI=D, Philips=E, Renasas=F, Samsung=G, Sanyo=H, Sharp=I, TI=J, Topro=K, Toshiba=L, Windbond=M
XX	Cell location	Tainan, Taiwan=TN
L	Cell line #	1~12=0~C
XX	Module location	Tainan, Taiwan=TN
L	Module line #	1~12=0~C
YMD	Year, month, day	Year: 2001=1, 2002=2, 2003=3, 2004=4… Month: Jan. ~ Dec.=1, 2, 3, ~, 9, A, B, C Day: 1st to 31st =1, 2, 3, ~, 9, A, B, C, ~, W, X, Y, exclude I, O, and U
NNNN	Serial number	By LCD supplier

24

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Approval

9. PACKAGING

9.1 PACKING SPECIFICATIONS

(1) 4 LCD TV modules / 1 Box

(2) Box dimensions：1040(L) X 310 (W) X 640(H)

(3) Weight：approximately 47Kg (4 modules per box)

9.2 PACKING METHOD

Figures 9-1 and 9-2 are the packing method

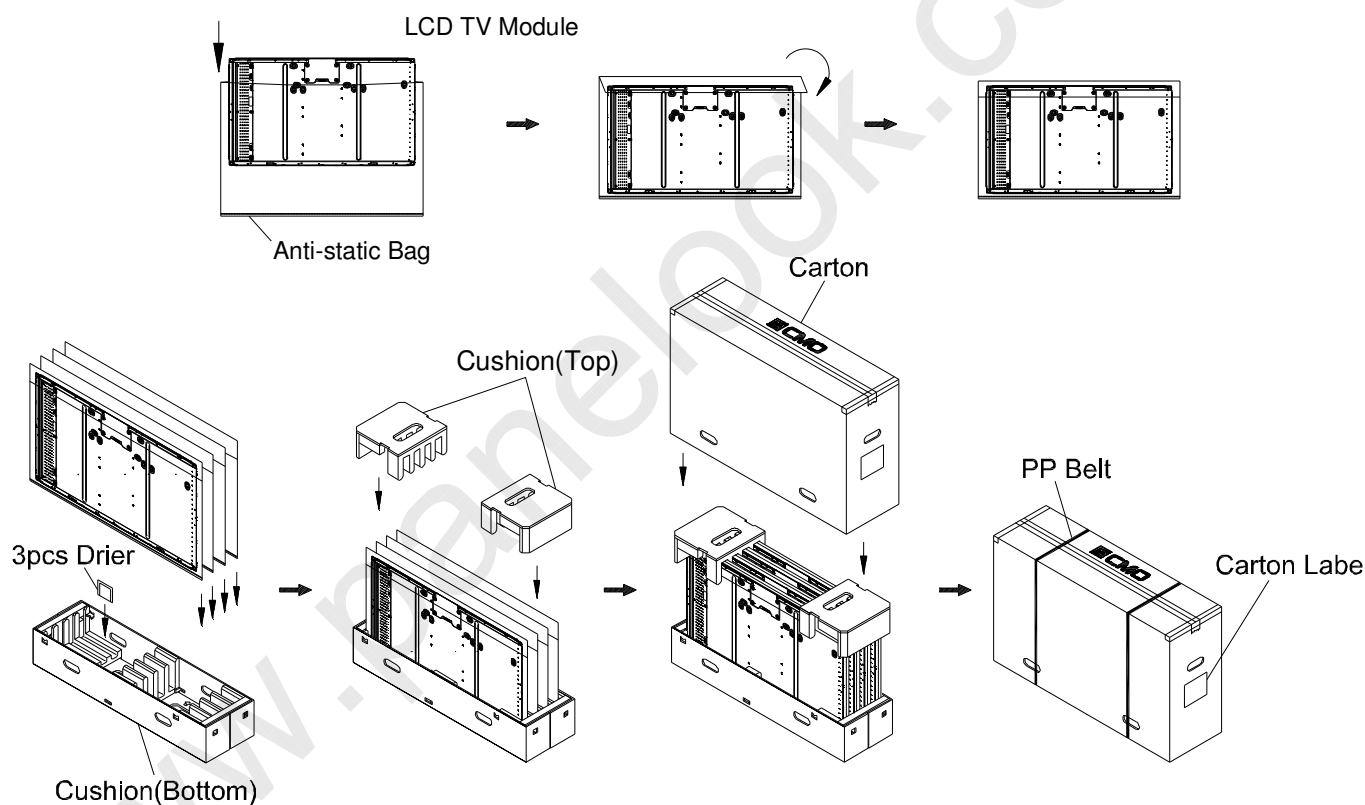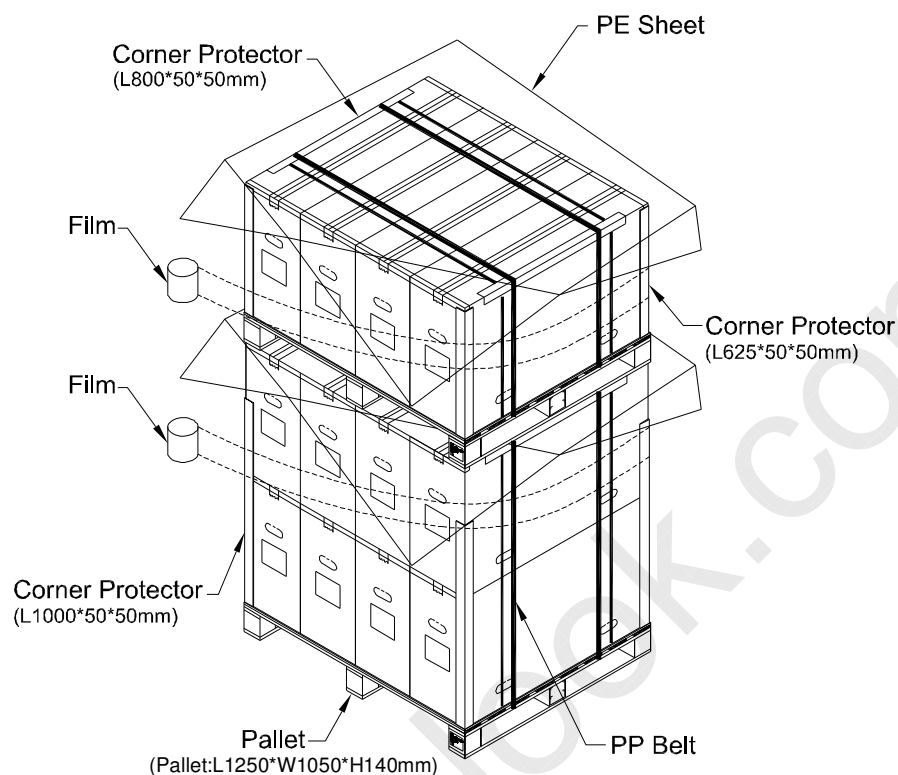LCD TV Module

Anti-static Bag

Carton

Cushion(Top)

3pcs Drier

PP Belt

Carton Labe

Cushion(Bottom)

Figure.9-1 packing method

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

Sea / Land Transportation (40ft Container)

Air Transportation
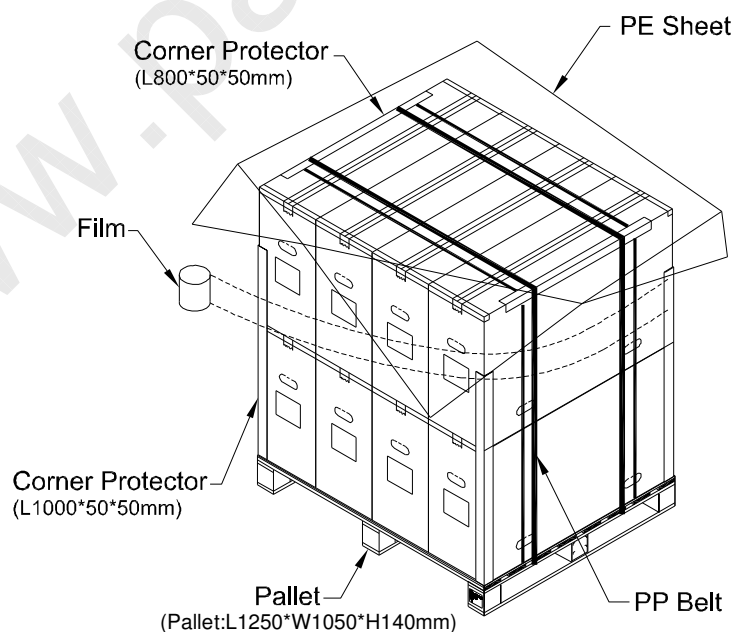
Figure. 9-2 Packing method

26

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Approval

10. PRECAUTIONS

10.1 ASSEMBLY AND HANDLING PRECAUTIONS

(1) Do not apply rough force such as bending or twisting to the module during assembly.

(2) It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

(3) Do not apply pressure or impulse to the module to prevent the damage of LCD panel and backlight.

(4) Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMOS LSI chips.

(5) Do not plug in or pull out the I/F connector while the module is in operation.

(6) Do not disassemble the module.

(7) Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

(8) Moisture can easily penetrate into LCD module and may cause the damage during operation.

(9) High temperature or humidity may deteriorate the performance of LCD module. Please store LCD modules in the specified storage conditions.

(10) When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.
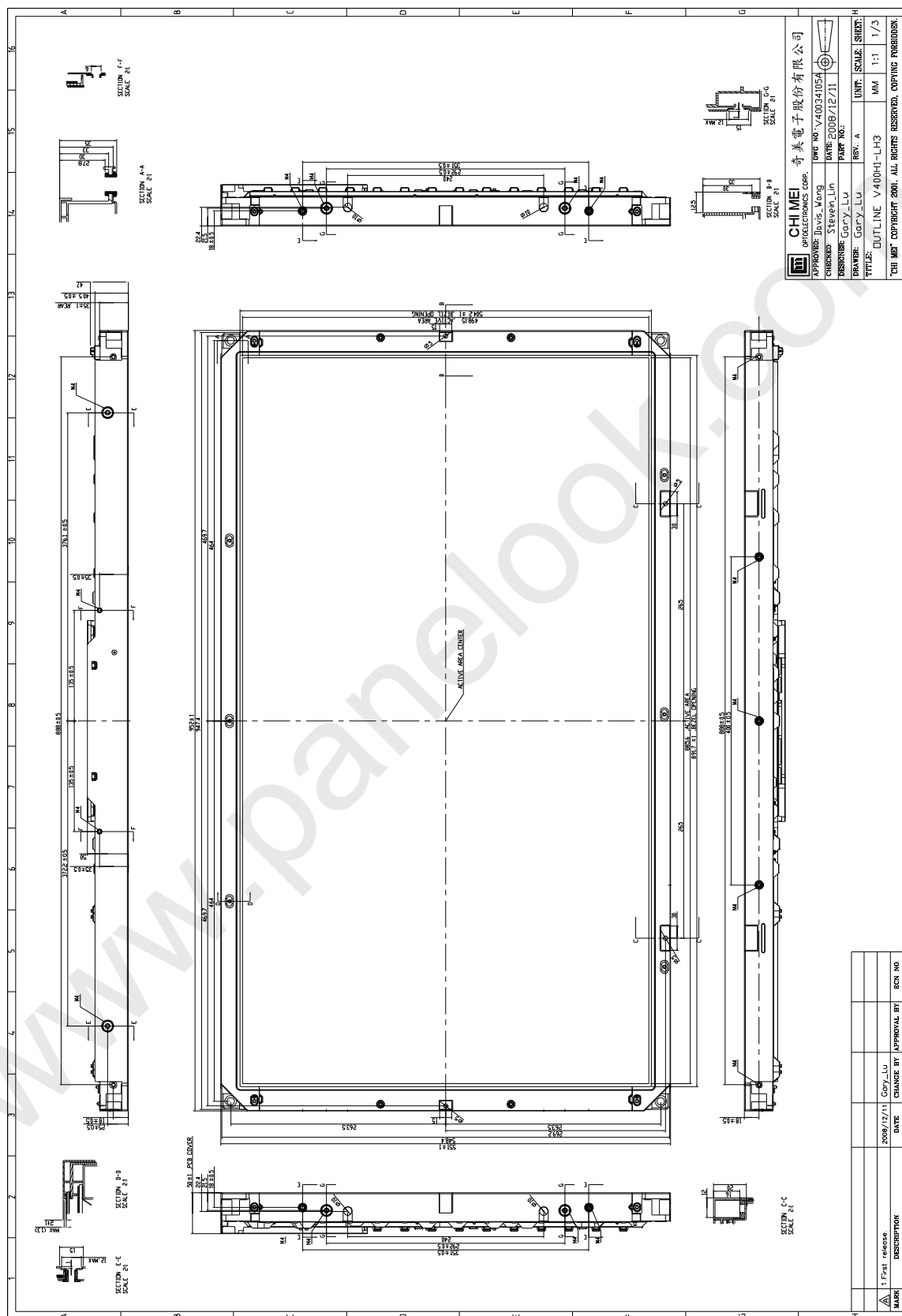
10.2 SAFETY PRECAUTIONS

(1) The startup voltage of a backlight is over 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the backlight unit.

(2) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

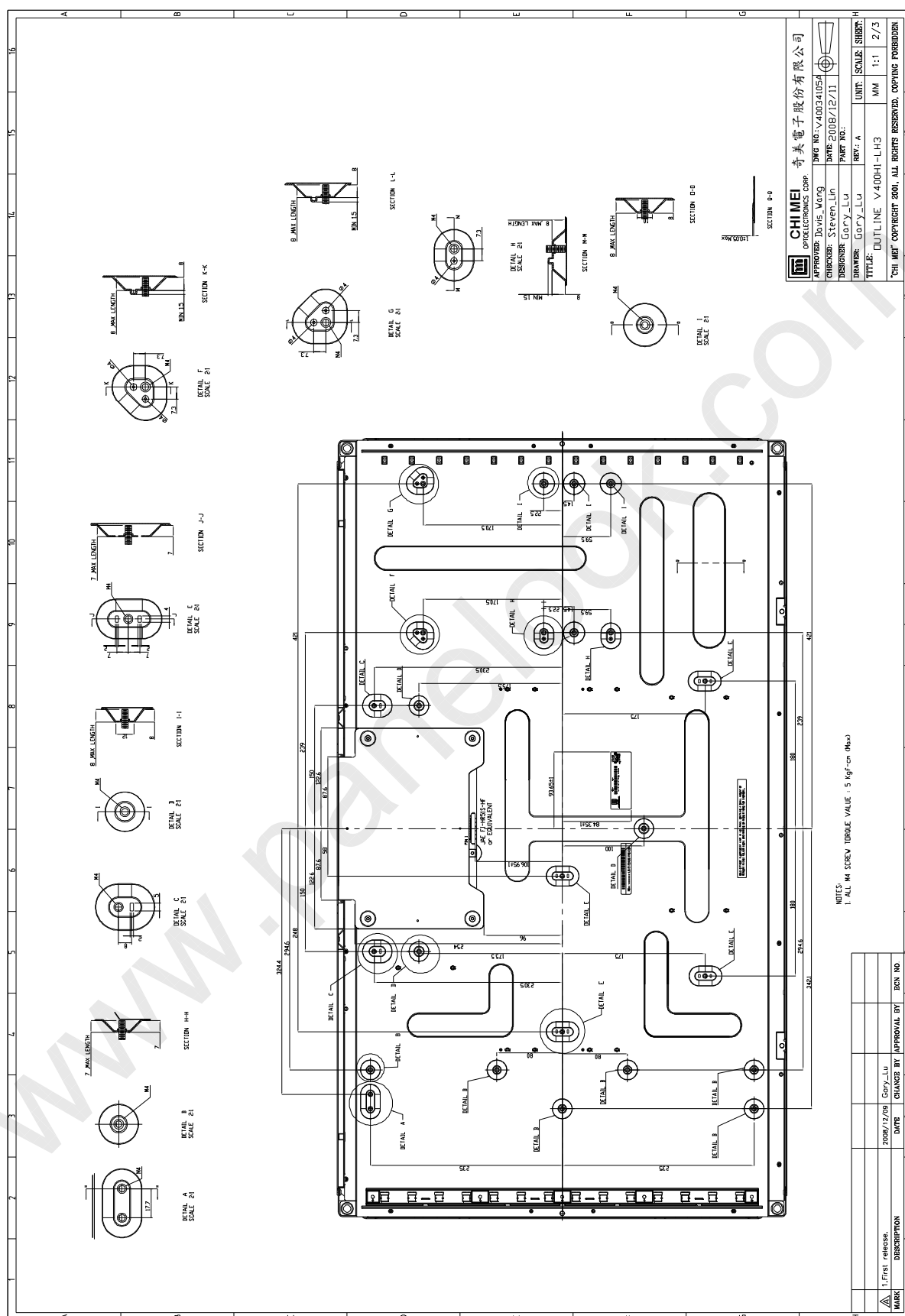(3) After the module's end of life, it is not harmful in case of normal operation and storage.

10.3 SAFETY STANDARDS

The LCD module should be certified with safety regulations as follows:

Regulatory	Item	Standard
Information Technology equipment	UL	UL 60950-1:2006
	cUL	CAN/CSA C22.2 No.60950-1-03: 2006
	CB	IEC 60950 -1:2005
Audio/Video Apparatus	UL	UL 60065:2006
	cUL	CAN/CSA C22.2 No.60065-03: 2006
	CB	IEC 60065:2006

27

The information described in this technical specification is tentative and it is possible to be changed without prior notice. Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

11. MECHANICAL CHARACTERISTICS

28

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   **Version 2.0**

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

29

Approval

30

The information described in this technical specification is tentative and it is possible to be changed without prior notice.
Please contact CMO 's representative while your product design is based on this specification.   Version 2.0

One step solution for LCD / PDP / OLED panel application: Datasheet, inventory and accessory! www.panelook.com
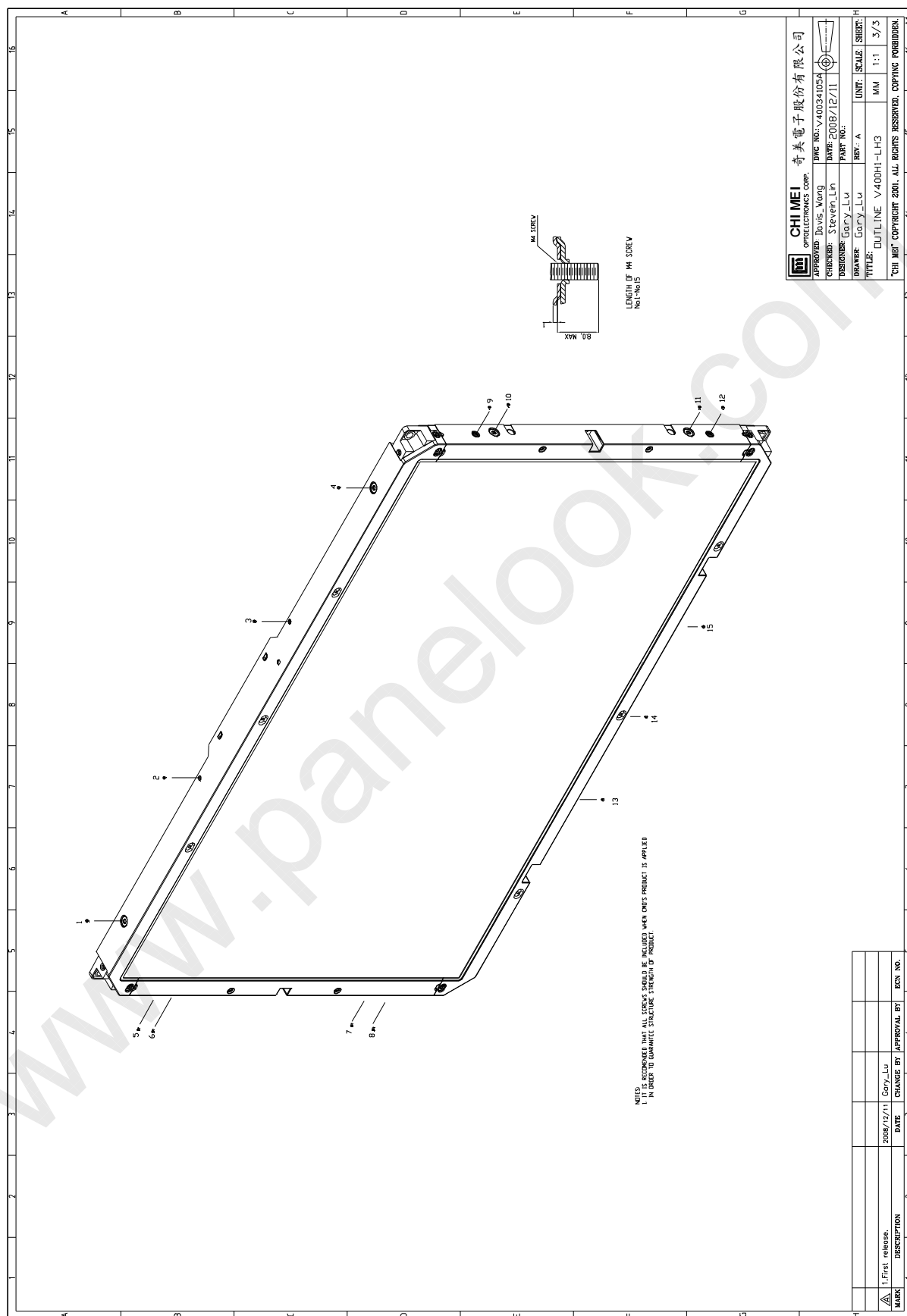
CHI MEI
OPTOELECTRONICS CORP.

Issued Date: Dec. 11, 2008
Model No.: V400H1   - LH5

Approval

31